

# X-ray Diffraction

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# X-Ray Diffraction

X-ray Diffraction is a technique to determine atomic and molecular structure of a crystal, in which the crystalline structure causes a beam of incident X-rays to diffract into many specific directions



# XRD components

Majorly XRD consists of 3 parts

1. X-ray Source
2. Sample holder
3. Detector



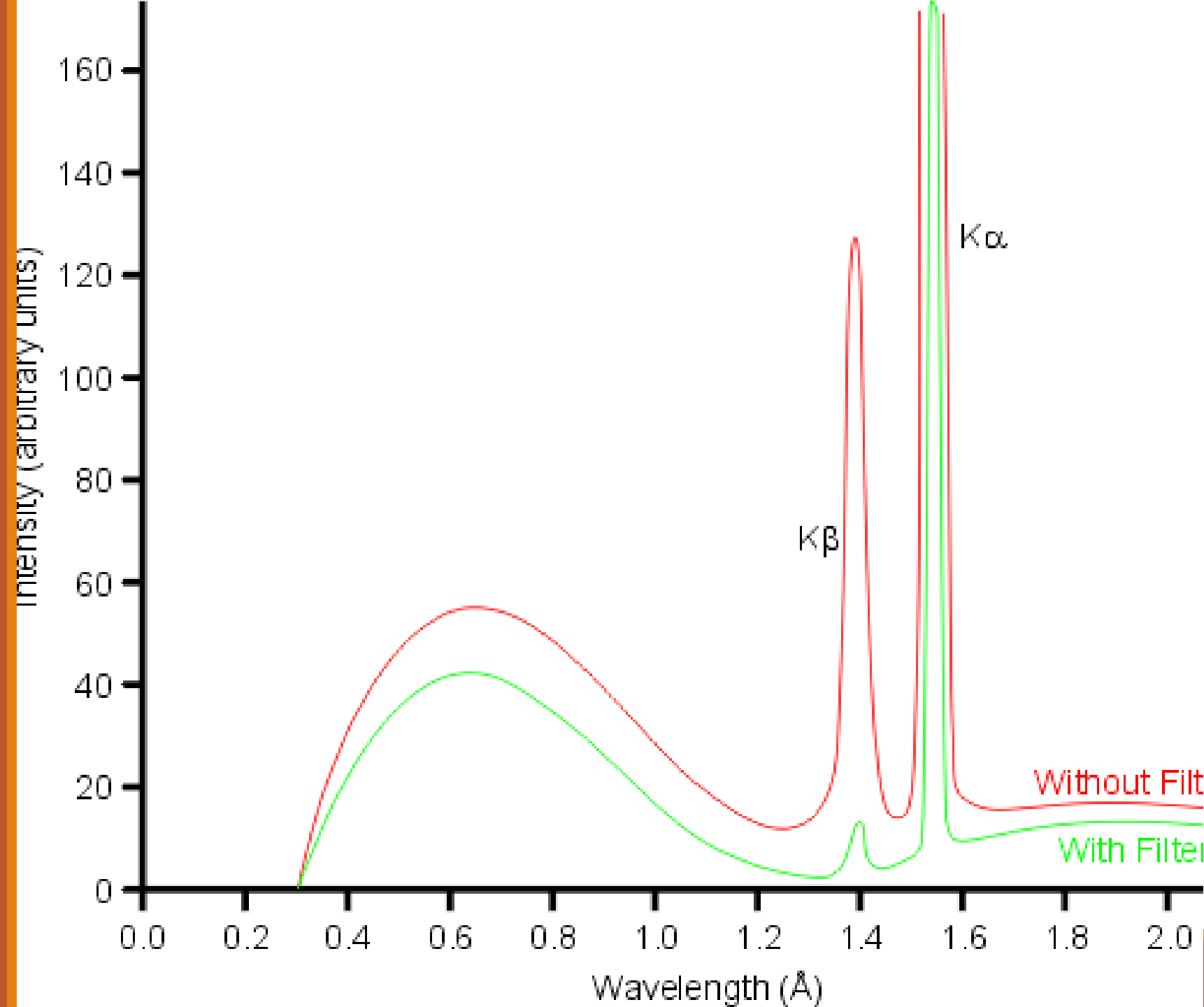
# XRD Working Principle

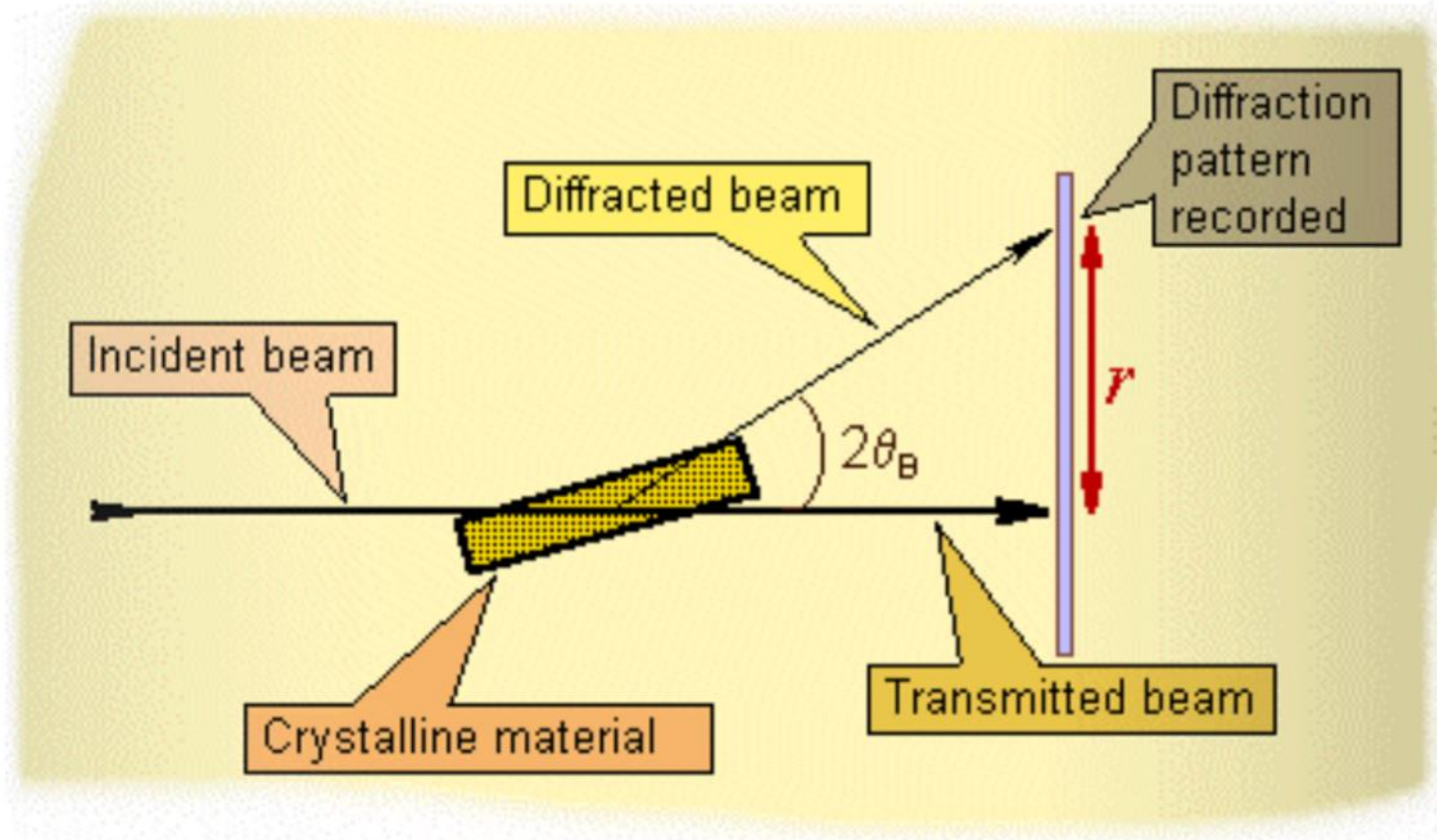
X-rays are generated in a Cathode ray tube by heating a filament to produce electrons, accelerating the electrons towards a target (Cu) by applying a voltage and bombarding the target material with the electrons.



# Characteristics X-rays

When electrons have sufficient energy then they dislodge the inner shell electrons and produces high intensities rays of more than one wavelength. It consists of  $K\alpha$  and  $K\beta$  rays. For diffraction from atomic plane a specific wavelength with high intensity is required so the filter is used that removes  $K\beta$  radiations and allow only  $K\alpha$  to pass.





Schematic of XRD working pattern



# Detector of XRD

Bruker D8 XRD consists of a Scintillator detector that detects the diffracted beams

Only those beams are significant that interfere constructively

Scintillator detector detects the beam and convert it into light signal and that is stored into the software to show results



# XRD Results

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Measures the average spacing between layers and rows of atoms

Determine the orientation of a single crystal or grain

Find the crystal structure of an unknown material

Measures the size and shape of small crystalline regions